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Meeting of December, 1918.

Volume XVII.
No. - - - 9

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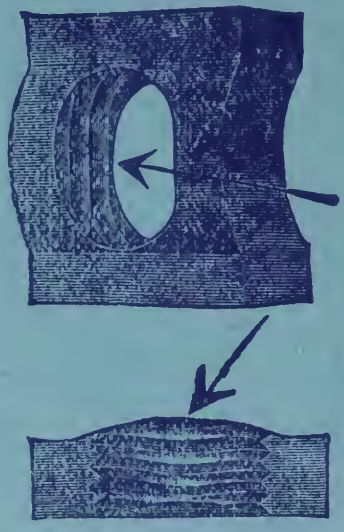

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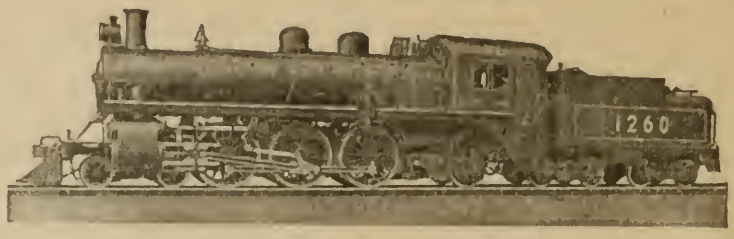

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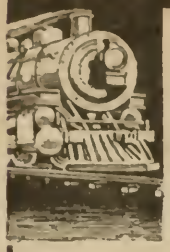

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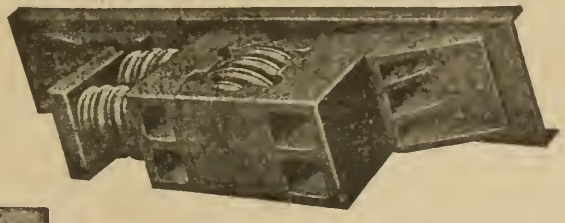

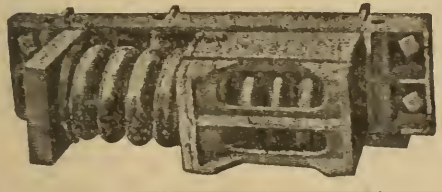

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PROCEEDINGS OF THE CANADIAN RAILWAY CLUB.

Windsor Hotel, Montreal,
10th December, 1918.

Mr. T. C. Hudson (President) in the chair.

MEMBERS PRESENT.

A. W. Allard
W. A. Appleton
H. E. Ayers
J. R. Ayers
W. H. Baker
C. W. Barrett
E. R. Battley
F. Bergen
S. Blumenthal
L. A. Boucher
W. Bourgeault
L. Brown
M. M. Campbell
A. J. Candlin
J. W. Carter
T. C. Chown
C. H. N. Connell
W. T. Coleman
F. W. Cooper
S. Couillard
M. H. Craigie
E. A. Cunningham
W. H. Estabrook
DéE. Evans
W. E. Evans
K. V. Gardner
F. J. Gibson
R. E. Hall
R. M. Hannaford
E. V. Harrison
J. Hay
N. Holland
G. F. Hudson
T. C. Hudson
W. C. Hunter
W. J. Hyman
E. G. Jackson
H. H. James
W. E. Joyce
A. Lachance
T. J. Lanno
H. R. Ledsham
A. Lecavalier
C. Lindner
B. K. Linagh
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A. Marchant
C. Martin
M. McKenzie
W. J. Mathieson
J. H. McCuaig
T. McDonagh
A. McDonald
E. S. McMillan
W. Miller
C. G. Mitchell
M. J. Mullally
K. E. Munro
J. Millington
H. R. Naylor
E. A. Nix
W. F. Nicholson
F. Nystrom
J. Ogden
R. W. Peacock
H. Pearce
P. P. Reynolds
G. W. Robb
A. Robertson
E. A. Robinson
F. M. Rollo
W. H. Sample
A. G. Seccombe
H. W. Sharpe
H. Spidey
B. F. Shortley
H. P. Swinton
H. H. Symmes
S. G. Taylor
H. W. Thorp
C. Tinkler
J. E. Tinkler
H. W. Tritt
C. W. Wells
H. E. Wheeler
F. O. Whitcomb
L. A. Williams
J. W. Winterson
G. M. Wilson
D. F. Yeaman
A. Riddington
James Powell
and others

Chairman:

The members will please come to order. The first order of business is the signing of the cards. The minutes of the previous meeting have been printed and distributed. If there is no objection we will consider them as read. The next order of business is the remarks of the chairman. I do not intend to take up any of your time to-night, but we will move to the next business. The Secretary will read the applications of new members.

Secretary:

The following applications have been received and passed upon by the Executive Committee and are submitted for your approval:

G. Duff, Roadmaster, C. N. R., 2434 St. Urbain St., Montreal.
W. H. Estabrook, Foreman Painter, Angus Shops, C. P. R., Montreal.
W. F. Forbes, Freight Manager, White Star Dominion Line, Montreal.
Jos. Hall, Car Inspector, C. N. R., 452 Aylmer St., Montreal.
Jas. Hay, Purchasing Dept., St. R., Montreal.
H. J. Humphrey, Supt., Laurentian Divn., C. P. R., Montreal.
A. Oldfield, Car Foreman, C. N. R., 359 Prefontaine St., Montreal.
R. W. Peacock, Foreman Stores Dept., C. P. R., 2241 Delorimier Ave., Montreal.
A. Seville, Asst. Foreman, G. T. Rly., 22 Eadie St., St. Henry, Montreal.
E. T. Spidy, Production Engr., C. P. R., Angus Shops, Montreal.
J. W. Winterson, Chief Counter Clerk, C. P. R., Passenger Dept., 113 Metcalfe St., Montreal.
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C. W. Wells, Chief Draughtsman, C. P. R., Angus Shops, Montreal.
A. R. Williams, Foreman Coachyard, G. T. R., St. Henri.
T. Wheatley, Can. Car & Fdry. Co., Turcot, P.Q.

Chairman:

The members have heard the applications read. What is your pleasure?

Mr. W. H. Sample:

I move they be accepted.

A Member:
I second the motion.

Chairman:
It has been moved anr seconded that these applications be accepted. Are all in favor? I declare the motion carried.

Chairman:
Has any member any new business to bring forward? If not, I might say an behalf of the Executive Committee that it is customary at this meeting to decide whether or not we shall have an Annual Dinner. No doubt you will remember that two years ago, on account of the war, it was decided that we would suspend the holding of the Annual Dinner, and it now becomes a question whether or not we have yet gone far enough in the way of peace to resume the former practice. It will be for the members to decide this and if it is agreed that an Annual Dinner is to be held we will appoint a committee to look after the programme and the other details.

Mr. Gordon Mitchell:
Mr. President, as one of the members of this Club, I think, considering conditions in the world generally, and the suffering of humanity—and especially that of our own brothers—that it would be rather out of place to hold this dinner, and this more especially as, according to reports, we are not yet out of the woods, and there may be some further deadly work to be done at the front before this thing is finished. There are a large number of necessary objects which demand our spare cash, and I think it would not be in keeping with the attitude of the Railway Club to be wining and dining when we have so many other ways of more beneficially spending our money.

Chairman:
I would be pleased to mear a further discussion. The object is to have the members advance their ideas without prejudice. Mr. Holland, what is your opinion?

Mr. Norman Holland:
Personally I am in favor of having it. It brings the boys together in a way that nothing else does. Smokers are all right in their way, and I think that while the war was on it was a patriotic measure to forego the Annual Dinner, but now that the war is practically over I think we should hold the dinner.

These dinners have been enjoyed by everybody and have been the means of bringing us together. I believe we should have the dinner this year.

Mr. Gordon Mitchell:

Mr. Chairman, I should like to qualify the remarks I made with the suggestion that if we do hold this dinner each member who attends will subscribe a portion of the cost of the ticket towards the "Red Cross."

Chairman:

As a matter of fact, we usually come out behind on the dinner, as the amount we charge per plate does not cover the expense, and this will no doubt be further increased now that the cost of living has gone up, so that if we are going to keep our heads above water we should charge more. For the benefit of the members who have just come in I might say that we are discussing the question of the Annual Dinner, which owing to war conditions was discontinued, and the question before the meeting is whether we shall hold the dinner this year. Last year we compromised on a smoking concert, the proceeds of which went to three charitable institutions. It is for the members to decide whether they would like the dinner this year.

Mr. Blumenthal:

Why not put the matter to a vote and let the majority decide? I am in favor of it and will move that we hold the dinner in the usual way.

Mr. Norman Holland:

I would suggest that one vote be cast in favor of it.

Mr. Hunter:

I believe that after four years of suppression it will do us no harm to have a little spread and get the boys together, so that we may feel a little more cheerful than we have in the past. I second the motion.

Chairman:

It has been moved by Mr. Blumenthal, seconded by Mr. Hunter, that we hold our Annual Dinner in January in the usual manner. Is there any discussion on the motion before it is put to the meeting.

Mr. W. H. Sample:

I think if we have the dinner we should tax each member enough for the tickets to cover the expense to the club. Brother Mitchell here shows a good spirit in suggesting that a portion of the contribution for the ticket go to some charitable institution. That is a good idea, but inasmuch as we nearly always contribute in a reasonable way to any commendable object that comes along and would subscribe just the same, it would hardly be necessary to carry out his suggestion, but I believe we should charge sufficient for the tickets to make the dinner self-supporting.

Chairman:

You have all heard the motion that we hold the Annual Dinner this year. Mr. Sample has made the suggestion that we should charge sufficient to cover the expense, so that we shall not put the Club behind to the extent of $200.00 or $300.00, as we have in the past. All in favor please signify in the usual manner.

I declare the motion carried.

Chairman:

Is there any other new business to bring up to-night? Under the heading of "Unfinished discussion of papers at previous meeting" I might say that at the last meeting it was decided to give Mr. Appleton an opportunity to reply to some of the criticisms that were made on his paper at the last meeting, and to some of the bouquets that were put over to him. There were some questions that some of the members wished to ask. Now is your chance.

Mr. W. H. Sample:

Mr. President, I did ask some questions at the last meeting, to start the ball rolling. Now that Mr. Appleton is here I have nothing to say. (Laughter.)

Mr. Appleton:

I regret very much that I was unable to be present at the last meeting and can assure the members that circumstances were such as to make it impossible for me to attend. I have not seen the paper since it was written and have forgotten to some extent what it contained, but if not infringing on the time of the Club to-night I will endeavor to answer any questions that may be asked.

Chairman:

Are there any members from the Mechanical Department who would like to ask any questions on the paper that was read at our last meeting?

Mr. W. H. Sample:

I think the only point I asked light upon was: What is an engine failure?

Mr. Appleton:

Anything byeond five minutes in charged to the locomotive (laughter).

Chairman:

That is just what I told him. Mr. Appleton, are there any further remarks you wish to make before we move along?

Mr. Appleton:

Not that I know of.

Chairman:

The next order of business is the reading of the paper for this evening on "Car Trucks," by Mr. L. Brown, Superviser, Angus Car Shops, Canadian Pacific Railway, Montreal. Mr. Brown, will you kindly come forward?

"CAR TRUCKS."

By L. Brown, Supervisor, Angus Car Shops, Canadian Pacific Railway.

A car truck is mechanically a small four or six wheel car under each end of a railroad car and carries the latter as a dead load by means of two swiveling centre plates connected by a centre pin or king bolt. The purpose of the truck is to enable short wheel bases to be used in connection with long car bodies. In England such trucks are called "bogies."

Trucks form an important part of railroad car equipment. Their weight is approximately one-half that of the body or one-third of the total weight of the car. If they are good almost any kind of a car has a reasonable chance of reaching its destination safely, but when they fail the result is usually a train wreck with serious loss. They are located near the ends of the cars so that they will be near the draft gears, and one of the ideals for a draft gear would be for it to pivot

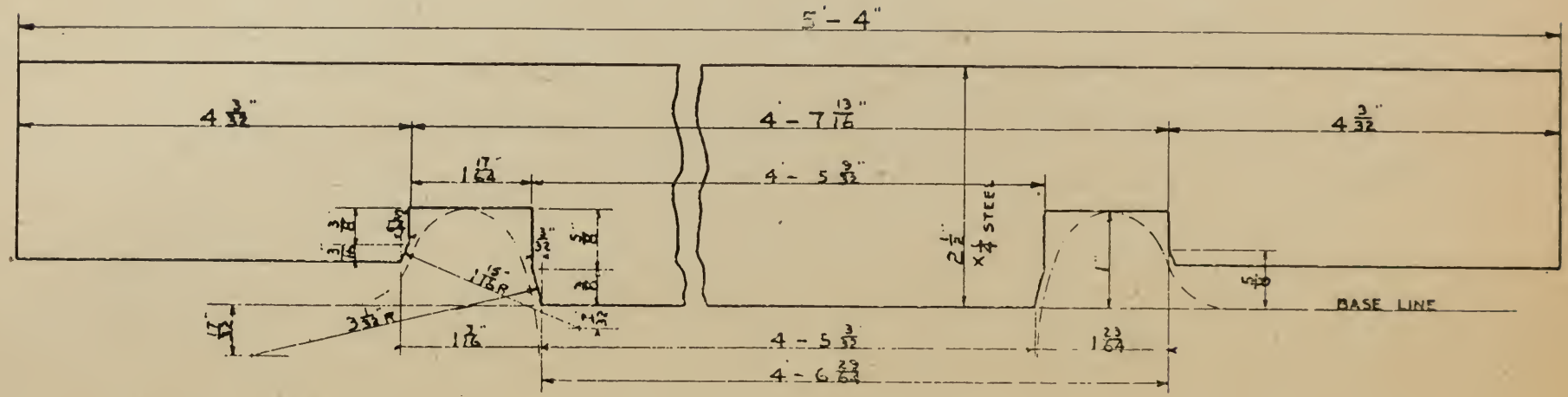
directly over the centre of the truck. The farther the draft gear is away from the center of the truck the more strain is placed on the truck laterally and consequently there is more danger of derailment. The trucks in further relation to the car body are as the supports of a bridge are to the superstructure, but they are also required to be capable of moving forwards and backwards, rotate horizontally under the superstructure, adjust themselves to uneven tracks and withstand severe strains from heavy loads, high speeds and sudden stops.

The usual construction of trucks consists of two or more pairs of wheels, each pair being connected together by an axle and the axles are held together by a frame which carries springs and other parts on which the car body rests.

The wheels have smooth rolling surfaces and they are kept from sliding down inclined track rails by the friction caused by their own weight and by the load they carry, and are prevented from slipping off the rails sideways by their flanges which engage with the inner edges of the rails. The larger the diameter of the wheel the less revolutions there are at the journals and the better the bearing on and against the track rail. The materials of which wheels are usually made are cast iron for freight cars and steel for passenger cars. Cast iron wheels are much cheaper than steel wheels and give excellent service under heavy loads running at moderate speeds, but they have not the tenacity to withstand shocks like those made of steel. The treads of cast iron wheels are chilled while in the molten state of casting, which gives them a harder wearing surface than the best steel has. The hubs are soft like ordinary cast iron and can be easily bored to fit the axles. Steel wheels are usually made by being forged, but some are cast. Some makers of light cast wheels endeavor to get a hard wearing tread as in the cast iron wheels by mixing manganese in the molten steel in such a way that it will appear in the tread but not at the hub. The forged wheels are made with thicker treads so that they can have their wearing surfaces renewed repeatedly, and this to a considerable extent offsets their larger cost when new. Tires which can be replaced by other tires after they are worn out are largely used on steel centres, and in some cases on cast iron centres. The usual method of securing tires is to bore them about one-thousandth smaller in diameter than the outside of the centres and then by heating so expand them that they will fit over the centres and tighten on them as they cool. If the tire is shrunk on much tighter than mentioned the steel is too much strained and is liable to break or the tire becomes loose in service.

The wheels are mounted on the axles by hydraulic pressure of approximately ten tons for each inch of wheel seat diameter thus making them rotate with the axles, which is very different to the method used on small vehicles, where the wheels usually rotate on axles which are fixed. The distances apart at which wheels may be mounted on axles is limited to a total variation of one-eighth of an inch, which makes it necessary for very careful work to be done, not only when mounting but also when making flanges, boring hubs and aligning axles.

The Master Car Builder's standard mounting and check gauge for wheels is used in two ways: by measuring from the back of one flange to the throat of the other when mounting, and by measuring between the backs and over the throats of the two wheels when checking after they have been in service. The method of measuring when mounting is correct, but the method of measuring when checking wheels in service is open to question, because it allows wheels to be out of gauge according to figure 9 on page 68 of the Master Car Builder's rule book. The rule book may be wrong in stating so positively that wheels are out of gauge if more than four feet, six and twenty-nine sixty-fourth inches, because wheels when mounted to this dimension exceed it as soon as the treads start to wear. The distance of four feet six and twenty-nine sixty-fourth inches is a standard dimension and if wheels do not exceed it when mounted they ought not to be condemned for exceeding it in service as long as they are within the limits intended by the check gauge. That the check gauge does the work it is intended to do is not apparent when wheels which have been correctly mounted are condemned as soon as the treads start to wear, because on account of its design it condemns the wheels when it cannot touch the treads of both of them and that this is wrong is proved by the fact that a large proportion of wheels in service are running safely which would be condemned by the gauge if it was tried on them, also, the gauge cannot measure on worn wheels the distance of four feet, five and three thirty-second inches at the original base line, as required by figure 9, on page 68 of the rule book. Worn wheels are intended to be limited by the wheel defect gauge, and the purpose of the check gauge should be limited to providing that wheels which were correctly mounted shall not be condemned by it unless they move from their original location in relation to each other. This purpose can be accomplished by a gauge of the same limiting dimensions as the present gauge, but stopped by the apex of the wheel flange in-



WHEEL MOUNTING AND CHECK GAUGE

(STOPPED BY APEX OF WHEEL FLANGE INSTEAD OF BY TREAD)

FEB. 20 1918

stead of by the tread. In cases of derailment the blame is very liable to be unjustly put against the wheels by the present gauge.

A wheel wearing hollow will cause the flange of the opposite wheel to continually wear itself away against the inner edge of the track rail. A wheel with a sharp flange is dangerous because of the greater liability for the flange to break off and also to mount the rail and cause a derailment. Sharp flanges are principally caused by wheels of unequal diameter being mounted on the same axle. The treads of the wheels are coned and the larger wheel in finding a diameter equal to the smaller wheel tracks nearer the outer rim thus forcing the smaller wheel to track nearer the flange. Curvature of tracks also has considerable effect in causing sharp flanges. The wheels on one side of a six-wheel truck are frequently forced three-fourths of an inch out of line with each other by the curvature of the track rails. A great saving of material in steel wheels can be made by taking those with worn flanges out of service before they reach the limits allowed by the Master Car Builder's wheel defect gauge. Steel wheels are frequently found on which the flanges are so much worn that three-fourths of an inch of metal has to be turned off the tire thickness in order to restore the tread and flange to the standard shape, while the opposite wheel on the same axle, which generally wears hollow, does not require more than one-fourth of an inch to be turned off. When we consider that one-eighth of an inch of tire thickness is worth a day's wages it is well worth while to inspect wheels closely under cars at home terminals for evidences of worn flanges. The Master Car Builder's wheel defect gauge is the only gauge in regular use for detecting worn flanges, but it was primarily intended for limiting the wear on cast iron wheels which cannot be re-turned, and it is unsuitable for gauging the flange thickness on wheels which can be re-turned, because it allows such wheels to get in the condition before mentioned. A very suitable gauge for limiting the flange wear of wheels which can be re-turned is the Master Car Builder's flange limit gauge for remounting cast iron wheels for cars of eighty thousand pounds capacity and over. When the bottom inside corner of this gauge (which is nearest the throat of the wheel flange) rests on the wheel tread, the flange is usually so worn that seldom more than three-eighths of an inch is required to be turned off to restore the standard shape. The use of this gauge will save further waste of good material and frequently prevent the necessity for remating wheels. A similar advan-

tage, but somewhat less, could be obtained by limiting the worn vertical height of flanges to 7/8" instead of 1" on wheels which can be re-turned.

The axles are made of steel and are of sufficient strength to carry the loads and to withstand the shocks they are liable to get under ordinary conditions. The shocks received from the track strain the axles as much as the load. All other parts of the truck which have to carry the load of the car should be proportionately strong with the axle. The whole load of the car is distributed on the axle journals which are located outside the wheels. The journals are finished smooth by rolling so as to reduce friction and prevent heating. Axles are also becoming universally used as a source of power to generate electricity for lighting passenger cars. The revolving axle is harnessed to drive a dynamo which is frequently supported by the truck frame. The journals are enclosed by a metal box which also holds a brass bearing on the journal, a wedge to keep the bearing in place and the oil and waste necessary to keep the journal and bearing lubricated. The purpose of the box is not only to hold these parts but also to keep out dirt and water. The causes of hot boxes are numerous but the troubles may generally be attributed to lack of proper movement of the parts in relation to each other or to lack of proper lubrication. When inspecting journal boxes it is well to see that they have freedom to move in pedestals, that covers fit well and are tight, that dust guards fit well around the wheel seat and inside the box but have freedom to move in the box, that journal collars are not too large or too small and that they have no sharp or rough edges to catch or tear the packing, that journals are perfectly smooth and that there is some clearance between the collar and the end of the bearing or between the side lugs of the bearing and the stops for same inside the box, that the bearing is central on the journal, that the wedge is resting on the bearing in proper relation to it and to the box, and that clearance is provided for the wedge to rock on its rounded surface under the top of the box; and that the packing is of good quality, free from grit, well oiled, and well packed in the bottom of the box to a height half way up the journal.

Journal bearings are made of brass because it is much softer than steel and therefore will not get hot so readily from the friction created in service; but brass is costly and they are lined by a cheaper and softer metal called "babbit," which is composed of lead and other ingredients which give it the required hardness for wear and yet render it soft enough to adjust

itself to the varying diameters of journals. Bearings on which the linings have become worn can easily be relined by melting off the old lining, retinning the connecting surfaces where necessary and recasting the old babbit metal as a new lining. It is not to be expected, however, that the new lining will adhere to an old bearing as well as to a new bearing on account of the oil which has saturated the brass, therefore, when melting the babbit, the bearing should not be made so hot that the tinning will be burnt off, and the oil on top of th emolten babbit should all be skimmed off before any metal is taken out of the caldron to be recast. Grooves on each side of the inside of the bearing are good to form keyways for the lining so that it cannot move out of place should it become loose, but this is not provided for in the M. C. B. standard designs. Some railroads re-bore the old brass thus providing a surface practically as good as on new brass.

Journal bearing wedges or keys are made of steel, either cast or drop forged, and others are made of malleable iron. Wedges partially hollow on the tops came into use a few years ago but have since been condemned on account of the ribs bedding into the tops of the boxes and thus doing away with the usefulness of the camber on the wedge, which is designed to eliminate the strains caused where the two track rails are not of equal height in relation to each other.

Journal box packing should act like a lamp wick so that it will keep the oil continually in contact with the journal. In order to do this the packing should not only be in sufficient quantity to reach the journal but it should have the quality of permanent springiness, as packing which sags soon loses contact with the journal. It is for this reason that wool waste is better than cotton. Packing which has been in service gets clogged and lumpy and contains dirt, cinders and metal which not only interferes with the process of lubrication but injures the journal. Such packing should be removed and renovated when cars are undergoing repairs. The renovating process is done by heating the packing so that it will loosen and allow the solid matter to fall apart.

Dust guards should be capable of keeping dirt and cinders from entering the back of the journal box at all times. They should fit close to the axle but without injuring it. The height and width should be such that they will have as much freedom to move in the slots in the boxes as the axles have, but the thickness of the guard should almost fill the slot. The method of closing up the top of the dust guard slot in the box

with a piece of tapered wood seems to leave something to be desired, as the blocks are frequently missing.

Truck frames have to transmit the load of the car to the axle journals and have to take the shocks from the track in return. They have also to keep the other parts of the truck in their proper places. There are two kinds of truck side frames most generally used for freight cars, one kind is the arch-bar type, built of rolled steel bars and the other consists of a steel casting. The arch-bar type has its faults, which are principally that its parts become loose under the severe usage they get. These parts are bolted together and the strains cause the bolts to get loose and the nuts become slack and eventually there would be numerous breakdowns if inspectors and repair men were not continually on the look out for parts getting slack. The cast steel frames are more expensive and though they overcome some of the troubles of the arch-bar type it is more difficult to obtain a casting to replace one that is broken, and also more difficult to put it in place when it is obtained. The welding of cast steel frames which have broken into two or more pieces does not produce good results and should only be used as a temporary expedient, and such frames should be replaced at the first opportunity. Small cracks may, however, be welded with good results. Attempts have been made to rivet the arch-bars together, and while this is some improvement it becomes a difficult proposition for repairs to be made at places where there are no facilities for cutting rivets. Other attempts have been made to improve the side frames by using two bolts at each column. This is of some advantage because by using two bolts or two rivets in line their size can be reduced with a corresponding increase in the area and strength of the arch-bars. Columns for arch-bar trucks are best made of cast steel because cast iron columns, even if very thick, will not stand the shocks delivered to them, neither will malleable iron castings. The truck frames are also arranged to hold the springs which carry the bolsters and to provide attachments for the brakes.

The bolsters being supported at the ends only and having to carry one-half of the car body at the centre have to be strong and substantial. There are two kinds of bolsters being made at present, those built of rolled steel sections and those made of steel castings. Both kinds of bolsters are giving good satisfaction and it is largely a question of cost as to which is the more satisfactory of the two.

The springs to a large extent reduce the jarring which a car would otherwise get from the track. The helical form of

spring is generally made of round steel bars turned into coils of a uniform diameter rising one above the other. The strength of these springs increases as the thickness of the steel increases and as the diameter decreases. The adding of coil upon coil simply gives the spring so much more movement and does not increase its strength to carry a load. These springs simply distribute the shocks and do not absorb any of them. Elliptic springs are made of flat steel plates put together in layers and arched. The strength of these springs increases as the thickness and number of the plates increases and as their length decreases. Elliptic springs are no stronger than semi-elliptic springs and the additional half of the spring simply gives so much more movement and absorbs twice as much shock by the friction between the additional plates.

The centre bearing is where the car body rests on the truck bolster. This is located at the centre of the truck and is so made that it forms a pivot between the car body and the truck. A pin through the centre keeps the bearing plate on the car body from getting away from the truck plate. Some centre pins are so designed that they will hold the trucks to the body when the car is derailed. Centre plates require lubricating occasionally, which is generally done when cars are being repaired. In order to keep the lubricating oil in place and to form a bearing for the centre pin a wall around the pin hole in the truck plate is a desirable feature.

Side bearings are required to prevent the car from tilting sideways and as they are located near each side of the truck they are formed to correspond with the radius from the centre. I tis not desirable for the car to rest on the side bearings all the time as it does on the centre bearings. In fact, it is the general practice to try to maintain an average clearance of from one-eighth inch to one-quarter inch at each side bearing. If a car is resting hard on its side bearings it is more liable to turn the trucks off the tracks. A side bearing should always be ready to receive the load of the car body temporarily whether on straight tracks or curved tracks and to move under it with as little friction as possible and to allow the load to release itself as soon as necessary. There are many designs of side bearings on the market, some of which are very complicated and expensive. It is desirable that they should be simple in construction and have as few parts as possible. Complicated bearings, which are usually designed to be anti-friction, are very liable to get out of order and their parts get lost and are difficult to replace. The old style of flat bearings with an oil well in the centre of the bottom part gives the least trouble to

maintain and probably averages greater efficiency than the more complicated roller bearings.

The swing hangers under truck bolsters enable the car body to ride more easily over curved tracks. If they are properly set they become lower on that side of the truck which rises on the outer track rail and higher as the other side becomes lower on the inner rail, thus allowing the springs, bolsters, and side bearings to maintain a more nearly horizontal position for the car body.

Various roller bearing schemes have been tried and are in quite general use but they are not a great success, as the rollers tend to bed themselves into the surfaces they come in contact with or they get clogged with dirt and cinders.

The brakes on a truck are attached to the truck frame, and the power required to stop a car is applied by means of metal shoes being forced against the treads of the wheels, thus retarding their tendency to roll on the rails. Generally, this power is applied at a height a little below the centre of the wheel, and on one side of the wheel only and the force in many cases exceeds the load on the wheel. One reason for applying the brakes on one side only is to have the arrangement of parts as simple as possible, but it is far from being the ideal system. The effect of applying the brakes on one side only is to force the axle journal to one side of the bearing and for the journal box to wear on one side against the truck frame. A better system is to apply the brakes on both sides of the wheels, and this is known as the clasp brake system. Some of the best passenger cars on this continent are now being equipped with this system, and it has been in use many years in England. It overcomes the bad features of the single sided system already mentioned and also allows lighter brake beams to be used. One of the troubles with the single sided system is that such great power is applied to the beams that they yield under the strain and make it difficult to maintain the correct piston travel at the air brake cylinder. Brake beams when new are required to withstand tests equal to the greatest pressure liable to be put on them in service, but it seems necessary that this test should be considerably increased so that they will be able to withstand the greatest service pressures after they have been in use for years. Trussed brake beams are now becoming universally used for freight cars, as the solid beams deflect too much under heavy cars and are also rapidly failing under light cars. On freight car trucks the attaching of brake fulcrums to the bolsters has a somewhat bad effect inasmuch as the pressure from the lever causes one side of the bolsters to

wear against the columns of the side frames whenever the brakes are applied. This wear is more apparent on trucks which allow the bolsters to have side motion. The suspending of brake beams from the truck frames is much better than suspending them from the bolsters because the frames move in relation to the wheels and do not have the variable vertical movement which the bolsters get from the springs. Safety supports should be provided for all beams in order to keep them from falling down on the track in case of failure of the ordinary hangers or pins.

Fastenings such as bolts, rivets, pins, cotters, nuts, nut locks, and other parts requiring replacement should be located and applied so that they will be conveniently accessible for work to be done on them easily.

The modern truck is made almost entirely of steel and of course has greater strength and staying qualities than those which were formerly made partially of wood, but it has not that extent of resiliency and feeling of easy riding which is a feature in favor of the wood frame trucks. In order to provide the easy riding qualities of steel passenger trucks resort is made to cushions of softer material, such as wood or rubber, and these are usually inserted under the centre plates and over the springs.

Clearances under all circumstances and at all times are a necessary requirement and provision for easy adjustment to compensate for wear and movement should be made in the design. Vertical clearances should be provided for springs and bolsters to be free when new and without any load, and for all the moving parts to be free under load when tires, journals, bearings, pins and springs are at their smallest limits. Horizontal clearances should be provided so that trucks can rotate horizontally on all railroad track curves. An approximate figure for horizontal clearances for passenger car trucks and one easy to remember is one inch for each foot distant from the centre pin. Clearances of parts above the top of track rails should be ample so that when wheels and other parts are worn down to their smallest limits there will be no danger of anything striking the track. Some track switch parts project two and one-half inches above the rails and all truck parts, with the exception of wheels, should always be kept well above that figure.

Friction between moving parts requires some consideration. Steel against steel soon wears away and steel against iron is little better. Steel against cast iron is somewhat better, but cast iron against chilled cast iron gives still better results.

These effects may be noted between journal boxes and pedestals, columns and bolsters, and upper and lower centre plates.

Trucks and their parts should, as much as possible, be kept to one standard for each kind in order to facilitate interchangeability and expedite repairs. One class of truck can be used under various classes of cars but what is standard for one railroad is too often not standard for other railroads and cars are frequently kept out of service for months waiting for unusual material to effect repairs. The Master Car Builder's standards should always be followed unless there is a very good reason to do otherwise, and all railroads should take an interest in helping that association to adopt the best practices that ingenuity can devise.

Chairman:

Mr. Brown's paper to-night gives ample room for discussion among car men as to the different types of trucks, and also the way in which they should be handled. I would like to hear from Mr. Nix on this subject.

Mr. Nix:

Mr. President, I am sorry you have called upon me first to speak on this subject. However, as it is necessary that someone start the discussion, it might as well be me as any one else.

Mr. Brown's paper seems so complete, in my opinion, there is but little to be discussed. If all railway companies and car manufacturing plants building or repairing cars would but follow the suggestions in Mr. Brown's paper, the car truck trouble and failure would be reduced to a minimum.

I am glad to see Mr. Brown make mention of both the arch bar and the cast steel truck. This question, I dare say, is one that the average car man has given but little consideration, and what can be written about car trucks would fill a large volume.

Personally I have seen a great many changes in the design and construction of car trucks. My father was for many years master car builder on a railway in Georgia, and when I was a boy I used to see them building cars having trucks with no springs. The trucks were built with a solid wooden bolster bolted to the arch bars on each side. The car had a wooden body bolster and was riding on four round rubber springs about 6 x 8 inches, located between the body and truck bilsters. These springs carried all the weight, the centre plates being used only to keep the truck in place.

Some few years ago, I was connected with the car depart-

ment of one one the large trunk lines in the States, and was located in a southern city. I was paid a visit by the President and other prominent officials of the line, and in conversation with the president, my opinion was asked about the merits of the various car trucks on the market at that time. I mentioned two designs of cast steel trucks, and stated that I was on the fence between them. One of the officials asked me if the arch bar truck was a good one, and I replied that in my opinion it was, but I also thought that there were better trucks. It immediately occurred to me that there was a reason for asking me the question, so I stated to the president that if he had time to listen to me, I would be glad to explain to him why I considered the cast steel truck superior to the arch bar truck.

I made mention of all the ills that an arch bar truck is subject to, such as broken and bent arch bars, broken and loose column bolts, broken and loose box bolts, worn box bolt holes and box bolts. I explained to him how some of the defects mentioned could cause incorrect wheel centres, causing bad tracking of wheels, resulting in worn treads and flanges.

I explained how an arch bar truck with improper wheel centres would find all the bad joints, bad frogs and bad switch points in the track. I also explained the inaccuracy in making repairs on repair tracks where facilities were not adequate for making repairs property, it being a well known fact that at out of the way places in making repairs, the car repairers usually use a jimmy bar through the holes and keep pulling the bars in such a way to where the bolts can be driven down with a sledge hammer.

A few months after this conversation took place I was transferred to another point on the line, and I learned that the same officials had interviewed practically all the car men in the system in the same manner that I had been interviewed, and that practically 90% of the car men on the line had recommended the arch bar truck, and the only reason they had for doing so was that it could be repaired so much easier than the cast steel truck.

My opinion at present is the same as when I was located in the south. I still feel that the cast steel truck is far superior to the arch truck bar, while it must be admitted that we have failures of both kinds, still my observation has been that the failures of the arch bar truck are very much in excess of those of the cast steel truck.

Chairman:

I think Mr. Nix has brought out some very salient features about car trucks and there is a good deal of truth in what he says. We all know that we generally have to keep men going around to tighten up loose bolts, putting in split pins and so forth, to keep the arch bar truck together. I have no hesitation in saying that I personally favor the soild steel truck.

Mr. Hyman:

I did not figure on being asked to say anything here to-night, but there are two points in Mr. Brown's paper which I would like to mention in a few words.

He says that the cast steel bolster and the rolled steel bolster have given equally good service. This has not been our experience on the Grand Trunk, as we have had to replace a large number of cast steel bolsters, which were broken in service, and we have found that a good design of O. H. S. bolster gives far better service than the cast steel type of bolster. Whether it has been a faulty design in the bolster I am not prepared to say, but it seems as if the stresses were not equally distributed in some of the cast steel bolsters and they have broken after they have been in service a while. At the present time I think that the bath tub type of bolster is the best for freight trucks.

There is another point also. Mr. Brown says there is a greater amount of efficiency perhaps in the old friction bearing than in the roller type generally adopted to-day. I agree with him in one respect that the old friction type is preferable to any of the complicated and freak bearings which we have on the market to-day, but at the same time the old type of friction bearing is not to be compared with the single roller side bearing made good and strong and applied to the car so that it will stand the hard knocks and usage to which side bearings are liable in freight service. The single roller bearing also helps materially when it comes to sharp curves, when the load is thrown on one side, as there is movement in the side bearing which helps the car around the curve, whereas with a friction bearing very little help would be given on the curve; in other words, the single roller side bearing as applied to cars has given satisfaction and helps the car over the road. I think, therefore, that we should stick by the single roller bearing.

I think Mr. Brown has covered the ground very thoroughly in regard to detail construction of car trucks, and I have enjoyed his paper very much.

Mr. Nix:

We have a good number of car men here to-night and ought to bring out a good discussion. There are eight or ten sitting around here.

Mr. Naylor:

Mr. President, after listening to the very interesting remarks of Mr. Nix in favor of the cast steel truck, it seems to me that possibly something might be said in favor of the arch bar truck.

In Canada the cast steel freight truck has not been adopted to any extent, which in itself would indicate that it has not been viewed entirely with favor in the past, owing possibly, to our extreme weather conditions; and again the high grade of castings required would, no doubt, prove to be a new problem with us and lead for some time to purchase in outside markets. The question raised by Mr. Nix regarding the number of arch bar truck failures, reminds me of the difficulties we experienced not long ago, but in our case it was the cast steel truck with its cracked frames and broken spring beams which caused the troubles.

Providing the arch bar truck is properly designed, I doubt if the difference in wheel centres varies to any serious extent, this condition will occur, but is due, I think, to the truck in the first place being of too light construction for its load; in which event the question is one of design and not type of truck. I also notice that on very heavy equipment, such as high capacity cranes, the arch bar truck is still being used, and it would appear that there is possibly more to be said in favor of the arch bar truck than we have already heard this evening.

Chairman:

We are glad to hear from the opposite side on this subject, but I am afraid it will take a lot of argument to convince many of us in favor of the arch bar truck. I should like to hear more discussion on the herits of the arch bar truck.

Mr. W. H. Sample:

The experience I have had with steel trucks under tenders extends far back for a number of years. We used to have the Fox truck. The Boston & Maine use it extensively now. I never saw a more unsatisfactory arrangement from by point of view. We could not keep them together or prevent the tender from derailing. It does not matter what kind of truck

you have, my experience has been that whatever it is, if on an engine or tender, it is the cause of the derailment (laughter).

I was going to say, in connection with my remarks about derailments, that when we adopted the Canadian Northern standard we thought we were going to be entirely free from derailments. I looked up a report the other morning and found that the 176, Canadian Northern build—had been all over the field.

Mr. Nix:

Mr. Sample makes special mention of the Fox truck. I had a great deal to do with the Fox truck when it was first placed on the market, and I think the consensus of opinion of a great many mechanical men, especially those in the south, was that the greatest trouble with the Fox truck was that it was entirely too rigid—its design and construction admitted of absolutely no flexibility. There was another truck put out about the same time as the Fox truck, called the "Ajax" truck. This truck was also a failure, due to the fact that it was entirely too rigid, notwithstanding the fact that it was a cast steel truck. Its construction, however, was against it, as is consisted of two side frames with a centre member rivetted to it, thereby making it perfectly rigid.

The present day cast steel truck, however, I think, has overcome these difficulties from the fact that they are made flexible; in fact, as much or more so than the ordinary type of arch bar truck.

Mr. Hunter:

I do not care to enter into a discussion on the merits of the different types of trucks because the gentlemen who have spoken are more capable men than I am to discuss this feature, but I would like to ask Mr. Brown what he thinks about the method used by some car builders of putting the bottom rod above the spring plank, as we used to call it, to assist in pre venting derailments caused by brake beams dropping on the track.

Mr. Brown:

Before a reply could be made to a question of that kind you have got to get the design into your head. The fact that the bottom rod is above the spring plank is a good feature in itself, because that is the part that is closest to the track, and if we can get it supported like that it is a good addition to the design; but it is not always practicable to get a bottom rod

into the location you speak of. I think you will find that the brakes are usually too low on the wheel with that arrangement. It is really a matter of design, but if you could do anything to ensure the bottom rod being above the spring plank it would be an improvement.

Mr. Hunter:

I have seldom heard of a derailment caused by a bottom rod dropping down and what I wanted to convey was that if the brake hanger broke the bottom rod assisted in holding it up and prevented the brake beam from falling down. The Canadian National Railways are using it on new cars and it certainly is a good feature.

Mr. Brown:

It is a good feature if you can work t e design in properly.

Chairman:

I might say that our standard truck has that feature, and it is a good one.

Mr. Appleton:

I have listened to Mr. Brown's paper with a good deal of interest.

The discussion seems to have centered on the best style of truck; that is, the arch bar versus the cast steel truck.

I am inclined to agree with what Mr. Nix has said. There isn't any doubt in my mind but that the style of truck referred to by him is superior to the arch bar design; that is, its tracking qualities are superior. It seems to me a matter of getting a steel truck that will stand up under service. We have experienced considerable trouble with arch bar trucks in fast service and although we increased the wheel base we were not able to overcome derailments or fet the service that we have been able to get from the pedestal truck. We have adopted the pedestal truck under our locomotive tender tanks.

The paper refers to the lining of journal bearings being cheaper than brass. When the cost of applying the lead lining is considered I think you will find it is more expensive than brass and is applied to overcome heating.

I had occasian to follow the performance of some tender bearings some time ago and found that we were getting over 100,000 miles from the lead lining without any pronounced wear, and naturally it occurred to me why we should not use cast steel instead of brass, but as there is always the danger of

the babbit lining wearing out it would be a very doubtful practice.

Mr. Barrett:

I do not think I can say very much, as Mr. Brown has covered the ground so well. I notice reference is is made to the brake. I believe the single brake is one of the greatest causes of trouble, and it seems to me that the clasp brake is desirable.

Mr. Gordon Mitchell:

I do not know that I can make any remarks on the subject under discussion, but I will tell you a little story: An old lady who was returning from church set the parson's wife, who said to her, "Well, Betty, what did you think of the sermon to-day?" Betty replied, "It was grand, grand!" "But did you understand it, Betty?" "Oh, no, no, I would na presume——" That is my position, gentlemen.

Mr. John Millington:

Mr. Chairman and members: Thanks are due to Mr. Brown for his paper. I cannot say very much about passenger or freight car trucks, as I have not had very much experience witr them, but I believe that the merits of a truck depend upon the mechanical ability used in building it. My experience has been that the party who put them together was to blame in the case of the arch bar or any other style of truck. I built a few trucks myself in the Canada Foundry at Toronto and Mr. Curtis, the inventor of the truck from Chicago, told me it was the best built truck he had ever seen turned out of any shop. As far as bearings are concerned, I have had something to do with them, as I am the inventor of the brass with the babbit lining, but if I told you all about this it would take a week. On the Grand Trunk some years ago they built a private car called the "Violet" to carry the president, Sir Rivers Wilson, and his bride over the road. This car had some work to do, and on the trial trip out it had some trouble and came back to the shop as the bearings all ran hot (laughter). Mr. McWood, who was then Superintendent of Car Dept., called me over and asked me if I could make it run cool. I said that I could. The brasses under that car were all lined with lead and lead would not stand the pressure. I got one of the old brasses and made a pattern and had the brass cast, put babbit lining in the brasses and they went under the car. The bearings were made large so that the axles could have a crown

bearing. The journals ran cool—not one being taken our during the tour.

Chairman:

This has been a very good discussion. Will someone move a vote of thanks to Mr. Brown?

Mr. W. H. Sample:

I move that we extend a vote of thanks for his very valuable paper.

Mr. Nix:

I second that.

Chairman:

Moved by Mr. Sample, seconded by Mr. Nix that we tender Mr. Brown a hearty vote of thanks for his valuable paper. (Applause.)

Mr. Brown, I take pleasure in conveying to you the thanks of this Club for your paper. If these is no further business before the Club the meeting will adjourn. The Secretary advises me that he has arranged for the usual sandwiches and coffee in the room at the rear and wants you all to stay.

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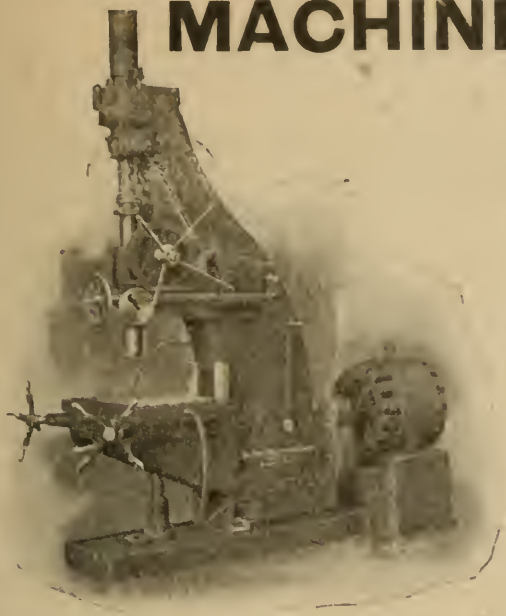

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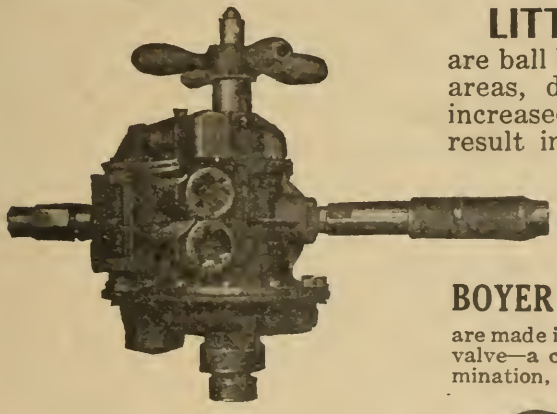

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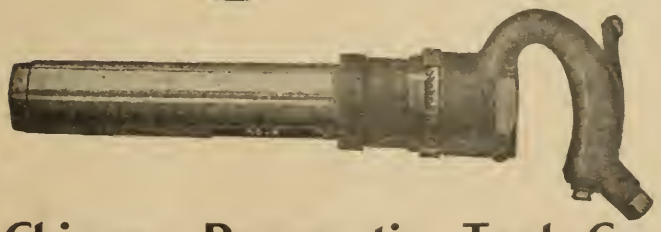

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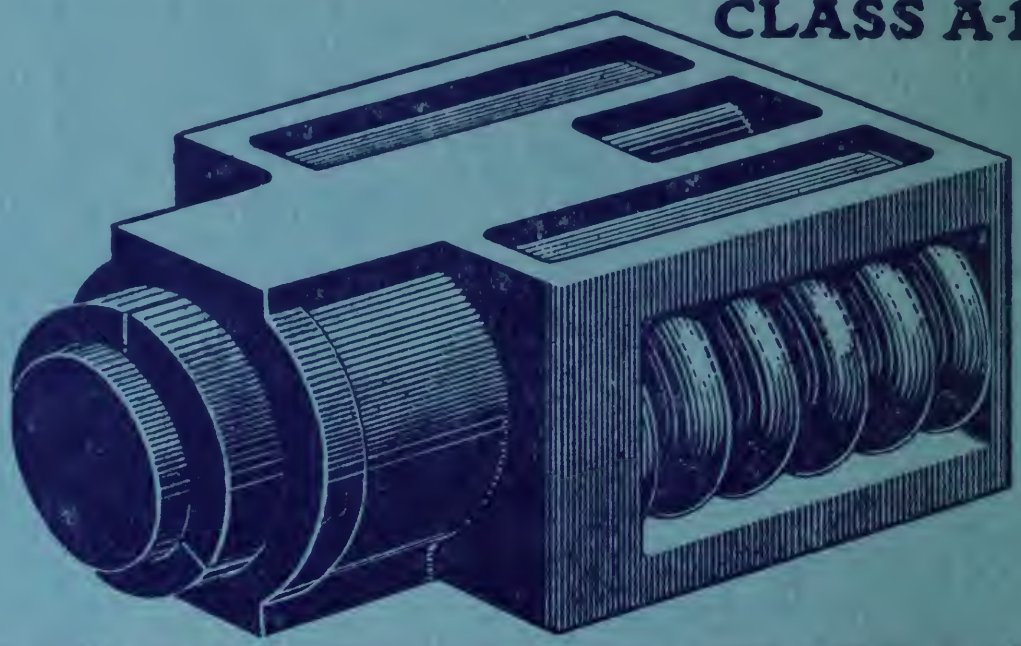

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